

A Systematic Study on the Marine Bryozoans in Korea 6. Ascophora

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한국산 해산 태충류의 계통분류학적 연구 6. 유낭류

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적 요

본 연구는 한국산 해산 태충류에 관한 연구의 일환으로서 1970년부터 1988년까지 남한의 삼면 연안과 도서지방에서 채집되어 이화여자대학교 생물학과에 보관되어 있던 재료와 본인들이 직접 채집한 재료들을 동정 분류한 것이다. 그 결과 12과 18속 25종의 유낭류가 밝혀졌으며 이 중에서 9종은 한국미기록종이었다.

Key words: systematics, bryozoans, Ascophora, Korea.

INTRODUCTION

The suborder *Ascophora* is the most dominant taxon of the bryozoans and one of the important groups in the marine ecosystem because they are not only occurring everywhere in the seas, but also of vital importance as fouling organisms in the encrusting of ship's bottoms, buoys, etc.

As a result of the systematic study on the ascophoran bryozoans in Korea, 52 species were reported in the previous papers including one new species (Okada, 1923; Kamita & Sato, 1941; Rho & Chung, 1975; Rho & Lee, 1980; Rho & Kim, 1981; Rho & Seo, 1984, 1985, 1986, 1988; Song, 1985).

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The present study was done with the materials collected from 40 localities during the period from 1970 to 1988 and preserved in the Department of Biology, Ewha Wamans University (Fig. 1.).

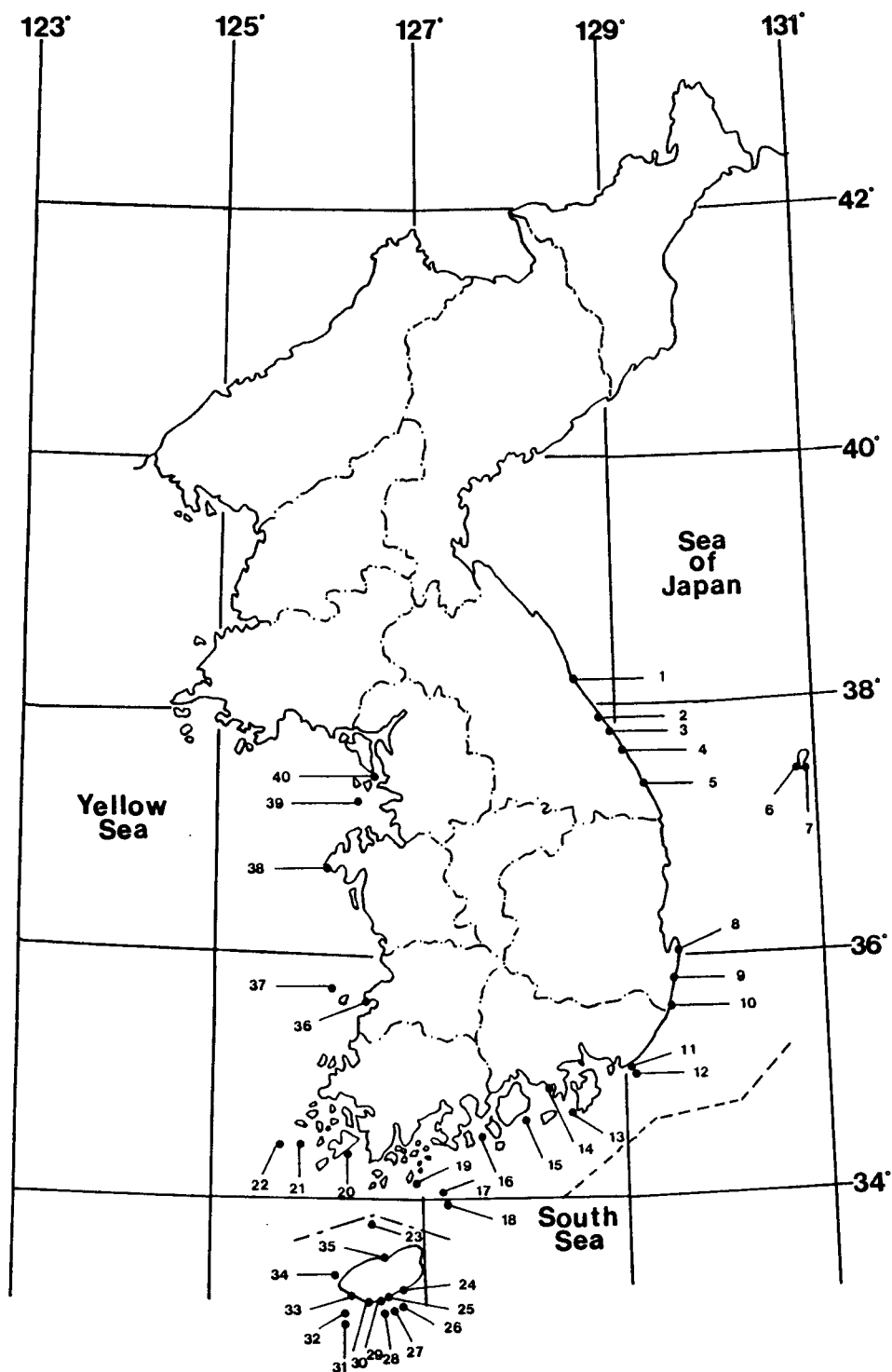


Fig. 1. Localities from which specimens of the present study were collected.

1, Sokch'o(속 초) ; 2, Chumunjin(주 문 진) ; 3, Samch'ök(삼 척) ; 4, Kündök(근 덕) ; 5, Wuljin(울 진) ; 6, Namyang(남 양) ; 7, Todong(도 동) ; 8, Kuryongp'o(구룡포) ; 9, Kamp'o(감포) ; 12, Orukto(오륙도) ; 13, Pijindo(비진도) ; 14, Samch'önp'o(삼천포) ; 15, Mokto(목도) ; 16, Kūmodo(금우도) ; 17, Annorudo(안노루도) ; 18, Kōmundo(거문도) ; 19, Ch'ōngsando(청산도) ; 20, Kapto(갑도) ; 21, Hūksando(흑산도) ; 22, Hongdo(홍도) ; 23, Ch'ujado(추자도) ; 24, Wimi-ri(위미리) ; 25, Sōgwip'o(서귀포) ; 26, Supto(술도) ; 27, Mundo(문도) ; 28, Chodo(조도) ; 29, Sammaebong(삼매봉) ; 30, Taep'o(대포) ; 31, Kwabut'an(과부탄) ; 32, Kap'ado(가파도) ; 33, Mosūlp'o(모슬포) ; 34, Piyangdo(비양도) ; 35, Chejuhang(제주항) ; 36, Kyōkp'o-ri(격포리) ; 37, Maldo(말도) ; 38, Anhūng(안흥) ; 39, Tōkchōkto(덕적도) ; 40, Chakyakto(작약도).

SYSTEMATIC ACCOUNT

Suborder 1. Ascophora Levinsen, 1909 유낭 아목

Family 1. Celleporariidae Harmer, 1957 섬유이끼벌레과

Genus 1. *Celleporaria* Lamouroux, 1821 섬유이끼벌레속

*** 1. *Celleporaria wakayamensis*** (Okada & Mawatari, 1938) 섬유이끼벌레 (Pl. 1, Figs.1,2)

Holoporella wakayamensis Okada & Mawatari, 1938, p.462, pl.24, fig. 14, text-fig. 7.

Specimen examined: Kapto, Jul. 6, 1974; Sammaebong, Jan. 18, 1985; Orukto, Apr. 28, 1978.

Description: Colony encrusting the seaweeds, the other bryozoans and the anthozoans, and forming a large irregular mass. Zooecia multilamellar, irregularly arranged, erect at the peristome bearing two or three long and strong spines; frontal with a few pores. Orifice circular, sometimes with notch on the proximal border. Suboral avicularium small and round, erect obliquely; rostrum dentate. Interzoooidal avicularium very large triangular; sometimes the end of rostrum is dentate. Ovicell large and globose, embedded in the succeeding zooid.

Remarks: According to the original description of Okada & Mawatari(1938), the zooecium had two spines and a large spatulate suboral avicularium. But, by scanning electron microscopy, our specimen had two or three spines, and small suboral avicularium was not substituted by the large spatulate one.

Distribution: Korea (South Sea, Yellow Sea); Japan.

*** 2. *Celleporaria brunnea*** (Hincks, 1884) 갈색섬유이끼벌레 (Pl. 1, Figs. 3,4)

Holoporella brunnea: Osburn, 1952, pp.496,497, pl.62, figs. 10-12; Soule & Duff, 1957, pp.127,128; Soule, 1961, pp.33-37; Soule & Soule, 1964, pp.39,40; Pinter, 1969, p.210.

Celleporaria brunnea: Soule et al., 1973, p.601, fig.79; Banta, 1980, p.396, fig.24,103.

Specimen examined: Maldo (Water depth 10m), Jul. 10, 1986.

Description: Colony encrusting the stem of the seaweeds, forming a mass. Zooecia indistinct and disoriented, erect at the peristome. Frontal coarsely granulated, sometimes with small areolar pores. The proximal border of the orifice nearly straight with a very small notch covered by the suboral umbo, and

The asterisks (*) indicate the species which were newly recorded in Korea.

a pair of condyles. Peristome bearing a pair of strong spines with black jointed bases at the proximal border. Suboral avicularium somewhat erect at the dentate rostrum. Interzoooidal avicularium very large and spade-shaped. Ovicell not found.

Distribution: Korea (Yellow Sea); British Colombia to Ecuador; Galapagos Is.; Taboga Is.; Costa Rica; Panama; Colombia; Queen Charlotte Is.

Family 2. Watersiporidae Vigneaux, 1949 물구멍이끼벌레 과

Genus 2. *Watersipora* Neviani, 1895 물구멍이끼벌레 속

3. *Watersipora subovoidea* (d'Orbigny, 1852) 자주빛이끼벌레

Specimen examined: Samch'ök, Aug. 6, 1976; Chumunjin, Aug. 6, 1984; Kündök, Aug. 7, 1984; Hongdo, Aug. 25, 1984; Anhung, Oct. 26, 1984; Taep'o, Jan. 16, 1985; Töckchöktö, Oct. 15, 1985; Samch'ök, Mar. 28, 1986; Kamp'o, Jun. 25, 1988; Wuljin, Jun. 26, 1988; Kūmodo, Jul. 31, 1988; An-norudo, Jul. 24, 1988; Piyangdo, Dec. 12, 1988.

Remarks: This species is the most common one found at all of the coast in Korea.

Family 3. Escharellidae Levinsen, 1909 입이끼벌레 과

Genus 3. *Mucronella* Hincks, 1880 침이끼벌레 속

4. *Mucronella perforata* Okada & Mawatari, 1937 구멍침이끼벌레

Specimen examined: Sögwip'o, Jul. 13, 1979; Todong, Jul. 11, 1984; Pijindo, Jul. 19, 1984; Kap'ado, Jun. 16, 1985; Maldo, Jul. 10, 1986.

Family 4. Rhamphostomellidae Kluge, 1962 부리이끼벌레 과

Genus 4. *Rhamphostomella* Lorenz, 1886 부리이끼벌레 속

*** 5. *Rhamphostomella argentea* (Hicks, 1881) 은부리이끼벌레**

(Pl. 2, Figs. 1,2)

Schizoporella oligopus: Robertson, 1908, pp.202,203, pl.20, figs. 50-52.

Schizopodrella kiiensis: Okada & Mawatari, 1938, pp.456,457, text-fig. 3.

Schizoporella kiiensis: Mawatari, 1952, p. 279, fig. 13.

Robertsonidra oligopus: Robertson, 1908, pl.34, figs.9-11, pl.35, fig.1.

Rhamphostomella argentea: Harmer, 1957, pp.1102-1104, pl.66, figs.19-22, 24-29, text-fig. 116.

Robertsonidra argentea: Powell, 1967, p.169, pl.2, fig.10.

Specimen examined: Sögwip'o, Jul. 13, 1979.

Description: Colony loosely encrusting the seaweeds by two or three small tubules. Zooecia hexagonal or oval; frontal convex, tubercular with a row of areolar pores. Orifice circular with a inconstant shape of sinus. Suboral avicularium unilateral, directed distally; mandible triangular and hooked like a beak. Suboral mucro is paired with avicularium. Umbo proximal to avicularium is raised. Ovicell very large, tubercular, with very small pores and central umbo.

Remarks: In our specimens, zooecia were not separated by a row of areolar pores. Frontal avicularium found in the specimens of Red Sea was not also observed.

Distribution: Korea (South Sea); Japan; California; Galapagos Is.; Lord Howe I.; Tahiti; Halmahera I.; Flores Sea; New Guinea; Ambon; Mediterranean Sea; Red Sea; Mannar Gulf; Indonesia.

Family 5. Schizoporellidae Jullien, 1903 구멍이끼벌레 과

Genus 5. *Schizoporella* Hincks, 1887 구멍이끼벌레 속

6. *Schizoporella unicornis* (Johnston, 1847) 한구멍이끼벌레

Specimen examined: Wölsong, Jun. 9, 1985; Maldo, Jul. 10, 1986.

Genus 6. *Arthropoma* Levinsen, 1909 관절이끼벌레 속

7. *Arthropoma ceciliae* (Audouin, 1826) 관절이끼벌레

Specimen examined: Taep'o, Jan. 16, 1985; Kap'ado, Jun. 17, 1985; Mosulp'o, Jun. 18, 1985.

Genus 7. *Calyptotheca* Harmer, 1957 은협이끼벌레 속

8. *Calyptotheca wasiensis* (Waters, 1913) 은협이끼벌레

Specimen examined: Sögwip'o, Jul. 12, 1979; Sangju, May 24, 1981; Mosulp'o, Jun. 18, 1985; Kwabut'an (Water depth 5m), Jun. 18, 1985; Chejuhang, Jun. 21, 1985; Ch'ujado, Feb. 6, 1986.

*9. *Calyptotheca symmetrica* (Ortmann, 1890) 상칭은협이끼벌레 (Pl. 3, Figs. 1-3)

Lepralia symmetrica Ortmann, 1890, p.40, pl.3, fig.11.

Specimen examined: Ch'öngsando, Jul. 25, 1981; Piyangdo, Jun. 19, 1985.

Description: Colony encrusting the stony corals. Zooecia arranged regularly, rectangular; frontal perforate. Orifice circular, with rounded sinus by a pair of condyles. Lateral avicularium one or two, directed distally; rostrum triangular. Ovicell not found.

Distribution: Korea (South Sea); Japan.

Genus 8. *Emballothea* Levinsen, 1909 못이끼벌레 속

10. *Emballothea pacifica* Harmer, 1957 태양못이끼벌레

Specimen examined: Taep'o, Jan. 16, 1985.

Family 6. Hippoporinidae Osburn, 1952 말구멍이끼벌레 과

Genus 9. *Stephanosella* Canu & Bassler, 1917 왕관이끼벌레 속

*11. *Stephanosella biaperta* (Michelin, 1945) 양입왕관이끼벌레 (Pl. 4, Figs. 1-3)

Schizoporella biaperta: Robertson, 1900, p.326; 1908, pp.287,288, pl.19, fig.41; Kluge, 1962, pp.579,580, fig.320.

Stephanosella biaperta: Osburn, 1952, pp.368, 369, pl.42, figs.1,2; Marcus, 1950, p.18; Soule & Duff, 1957, p.114; Rogick, 1964, p.178, fig.34; Soule et al., 1975, p.603, fig.82.

Specimen examined: Mundo (Water depth 30m), Dec. 3, 1978; Sögwip'o, Jul. 12, 1979.

Description: Colony encrusting the substratum not confirmed, forming a mass and erect when old. Zooecia multilamellar, hexagonal, arranged regularly; frontal flat, with a few of small pores at the proximal surface and a row of four or five areolar pores on each side. Orifice semielliptical, a little longer than wide,

with U-shaped sinus formed by a pair of condyles. Lateral avicularium, almost circular, sometimes substituted by triangular one, raised at the rostrum. Frontal avicularium triangular, erect, directed laterally. Ovicell not found.

Remarks: In our specimens, lateral avicularium was only one, except only one zooecium.

Distribution: Korea (Sea of Japan, South Sea); British Colombia to Galapagos Is.; Baffin Bay to Massachusetts; Florida; Venezuela; Denmark; Algeria; West Greenland; Jan Mayen I.; Spitsbergen; Bering Sea; Okhotsk Sea; Barents Sea; White Sea; Kara Sea; Chukchi Sea; Laptev Sea; Barrow Cape.

Family 7. Microporellidae Hincks, 1879 소공이끼벌레 과

Genus 10. *Microporella* Hincks, 1877 소공이끼벌레 속

12. *Microporella cribrosa* Osburn, 1952 채소공이끼벌레

Specimen examined: Kapt'o, Aug. 6, 1974; Sögwip'o, May 22, 1982; Taep'o, Jan. 16, 1985; Kap'ado, Jan. 17, 1985; Kūmodo, Jul. 31, 1988; Piyangdo, Dec. 12, 1988.

13. *Microporella discors Uttley & Bullivant, 1971 불협화소공이끼벌레 (Pl. 2, Figs. 3,4)

Microporella discors Uttley & Bullivant, 1971, pp.45,46, fig.39.

Specimen examined: Mokto, Jul. 29, 1980; Namyang, Jul. 2, 1984; Chejuhang, Jun. 21, 1985; Taep'o, Jan. 16, 1985; Kūmodo, Jul. 1988; Piyangdo, Dec. 12, 1988; Kōmundo, Jul. 27, 1988.

Description: Colony encrusting the seaweeds and the shells. Zooecia hexagonal; frontal granulated, perforate with small pores. Orifice semielliptical; the proximal margin straight and denticulated. Proximal to peristome with four distal spines, ascopore is formed, crescentic, perforate. Avicularium is located at the side of the ascopore; rostrum directed laterally; mandible long setiform. Ovicell semielliptical, a little longer than wide, embedded, granulated, with a row of pores.

Remarks: Zooecia of our specimens were different from original description of Uttley & Bullivant(1971) in perforate ovicell and ascopore near to the orifice. This species needs to be discussed continuously.

Distribution: Korea (South Sea); Chatham Is.

Genus 11. *Fenestulina* Jullien, 1888 방사이끼벌레 속

14. *Fenestulina malusii* (Audouin, 1826) 방사이끼벌레

Specimen examined: Mip'o, May 25, 1981; Ch'öngsando, Jul. 25, 1981; Mip'o, Dec. 10, 1981; Töckh'ökto, Oct. 16, 1985.

15. *Fenestulina mutabilis* (Hastings, 1932) 변이방사이끼벌레

Specimen examined: Mip'o, Jul. 13, 16, 1974; May 25, 1981; Dec. 10, 1981; Pijindo, Jul. 19, 1984; Samch'önp'o, Jul. 23, 1984; Ch'ujado, Feb. 6, 1986; Maldo (Water depth 10m), Jul. 10, 1986.

Family 8. Onchoporidae Busk, 1884 산호부치이끼벌레 과

Genus 12. *Onchoporella* Busk, 1852 산호부치이끼벌레 속

16. *Onchoporella selenoides* Ortmann, 1890 산호부치이끼벌레

Specimen examined: Mip'o, Jun. 22, 1985.

Family 9. Adeonidae Jullien, 1903 사슴뿔이끼벌레 과

Genus 13. *Adeonella* Busk, 1884 아데오넬라속

'17. *Adeonella platatea* Busk, 1884 넓적부리이끼벌레 (Pl. 5, Figs. 1-3)

Adeonella platatea Busk, 1884, p.184, fig.4,4a, text-fig.30; Harmer, 1957, pp.809-813, pl.33, figs.2,3,23, text-fig.82,A,B, text-fig. 84,E,G.

Adeonella minutipora: Canu & Bassler, 1929, p.379, pl.31, figs. 1-13.

Specimen examined: Wimi-ri, Jul. 8, 1972; Supto, Feb. 15, 1976; Mundo(Water depth 30m), Dec. 3, 1978; Sögwip'o, Jul. 13, 1979; Pömdo, May 31, 1982; Taep'o, Jan. 16, 1985; Kwabut'an (Water depth 5m), Jan. 17, 1985.

Description: Colony branched and forming a mass. Zooecial hexagonal; frontal perforated by areolar pores, with a large pore proximal to orifice. Orifice nearly semicircular; peristome developed. Suboral avicularium, unilateral or paired, triangular, most directed distally. Sometimes small frontal avicularia directed inconstantly. Vicarious avicularium very large, directed distally; mandible rounded. Marginal avicularium very large; the end of mandible acute.

Distribution: Korea (South Sea); Philippines; Celebes; Aru Is.; Sumbawa.

'18. *Adeonella polymorpha* Busk, 1884 다형이끼벌레 (Pl. 6, Figs.1,2)

Adeonella polymorpha Busk, 1884, pp. 183,184, pl.21, figs. 1a,2a,3,3a; Harmer, 1957, pp.810-813, pl.33, figs. 4,6,7,8,10, text fig.84, I-K.

Specimen examined: Sögwip'o, Aug. 7, 1970; Pömdo (Water depth 60m), Feb. 7, 1971; Sögwip'o, Apr. 15, 1975; May 22, 1982.

Remarks: Colony encrusting the seaweeds. The mandible of vicarious avicularium in *A. platatea* was round, but in this species triangular. All characters except the shape of mandible were similar to *A. platatea*. Harmer(1957) regarded this species as *A. platatea* var. *polymorpha*. In this study, *A. platatea* and *A. platatea* var. *polymorpha* were found from the same localities in Cheju-do. Therefore, the authors separated *A. platatea* var. *polymorpha* from *A. platatea*, and regarded the two species as different species like original description of Busk (1884).

Distribution: Korea (South Sea); Philippines; Celebes; Aru Is.; Sumbawa.

Family 10. Margaretinidae Harmer, 1957 마가레타이끼벌레 과

Genus 14. *Margaretta* Gray, 1843 마가레타이끼벌레 속

19. *Margaretta cereoides* (Ellis & Solander, 1786) 왁스이끼벌레

Specimen examined: Sammaebong, Jan. 18, 1985.

Family 11. Reteporidae Smitt, 1867 망이끼벌레 과

Genus 15. *Iodictyum* Harmer, 1933 빨간망이끼벌레 속

20. *Iodictyum axillare* (Ortmann, 1890) 빨간망이끼벌레

Specimen examined: Mip'o, Jul. 15, 1974

21. *Iodictyum deliciosum* Harmer, 1934 섬세망이끼벌레 (Pl. 6, Fig.3)

Specimen examined: Mip'o, Jul. 15, 1974; Maldo(Water depth 10m), Jul. 10, 1986.

Genus 16. *Reteporellina* Harmer, 1933 망이끼벌레 속

22. *Reteporellina denticulata* (Busk, 1884) 등색망이끼벌레

Specimen examined: Supto, Apr. 12, 15, 1975; Mosulp'o, Jun. 18, 1985.

Genus 17. *Phidolopora* Gabb & Horn, 1862 연구멍이끼벌레 속

*** 23. *Phidolopora pacifica* (Robertson, 1908)** 태양연구멍이끼벌레 (Pl. 7, Figs.1-3)

Retepora pacifica Robertson, 1908, p.310, pl.24, figs. 81-84.

Iodictyum pacifica: Sakakura, 1935, pp.114,115.

Phidolopora pacifica: Osburn, 1952, pp.448,449, pl.33, figs.1,2; Soule et al., 1975, p.399, figs.74,84.

Specimen examined: Kyökp'o-ri, Jun. 11, 1975; Maldo(Water depth, 10m), Jul. 10, 1986.

Description: Colony erect, forming convoluted mass of considerable size, fenestrated to produce an intricate network. Fenestra oval and pointed at both ends. Zooecia relatively long; frontal flat with three to five pores. Orifice circular; proximal border with a deep U-shaped sinus; two spines on each side distally. Large avicularium proximal to orifice, triangular; rostrum raised and hooked. A similar avicularium is present on the dorsal side, especially near the lower ends of the fenestra. Ovicell prominent, subglobular, with a small U-shaped labellum.

Distribution: Korea (Yellow Sea); Japan; British Colombia to Peru; Galapagos Is.

Family 12. Celleporidae Busk, 1852 가지이끼벌레 과

Genus 18. *Celleporina* Gray, 1848 가지이끼벌레 속

24. *Celleporina geminata* (Ortmann, 1890) 가지이끼벌레

Specimen examined: Mip'o, Jul. 13, 1974; Dec. 9, 1974; Sögwip'o, May 22, 1982; Taep'o, Jan. 16, 1985.

Remarks: Vicarious avicularium is variable in shape and size, from wide to narrow spatulate form, large and small, and long and small. In some suboral avicularium, rostrum is dentate.

25. *Celleporina porosissima* (Okada, 1923) 포로시시마가지이끼벌레

Specimen examined: Chakyakto, Sep. 17, 1974; Hüksando, Jul. 6, 1973; Sögwip'o, Jul. 13, 1979; Wölsöng, Jun. 9, 1985; Anhüng, Aug. 1, 1985; Maldo, Jul. 10, 1986; Sokch'o, Jun. 29, 1988; Kuryongp'o Jun. 25, 1986; Chumunjin, Jun. 28, 1988.

ABSTRACT

During the course of a systematic study of the marine bryozoans in Korean waters, a

total of 25 species of the ascophoran bryozoans were collected, and that belong to 21 genera and 12 families. Of them, the following nine species new to Korean waters are examined and described with the scanning electron microscope(SEM): *Celleporaria wakayamensis*, *C. brunnea*, *Rhynchostomella argentea*, *Calyptotheca symmetrica*, *Stephanosella biapertura*, *Microporella discors*, *Adeonella platalea*, *A. polymorpha* and *Phidolopora pacifica*.

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EXPLANATION OF PLATES

PLATE 1

Figs. 1-2. *Celleporaria wakayamensis* (Okada & Mawatari, 1938)

Fig. 1. Colony.

Fig. 2. Arrangement of zooecia with large orifice(or) and long spines. Suboral avicularium(sav) with serrate rostrum and interzoooidal avicularium(iav) with long triangular mandible.

Fig. 3-4. *Celleporaria brunnea* (Hincks, 1884)

Fig. 3. Colony.

Fig. 4. Arrangement of zooecia with spine bases(sp) and suboral avicularium(sav) below orifice(or). Interzoooidal avicularium(iav) with spade-shaped mandible.

PLATE 2

Fig. 1-2. *Rhamphostomella argentea* (Hincks, 1884)

Fig. 1. Colony.

Fig. 2. Arrangement of zooecia. Pseudosinus(s) is formed by asymmetrical lobe below orifice. See umbo(u) below avicularium(av) with beak-shaped rostrum and at the middle part of ovicell(ov).

Figs. 3-4. *Microporella discors* Uttley & Bullivant, 1971

Fig. 3. Colony.

Fig. 4. Arrangement of zooecia with semicircular orifice(or) and avicularium(av) situated on lateral to ascopore(ap) below orifice(or) with denticles(arrow).

PLATE 3

Figs. 1-3. *Calyptotheca symmetrica* (Ortmann, 1890)

Fig. 1. Colony.

Fig. 2. Arrangement of zooecia with orifice(or).

Fig. 3. Orifice(or) with condyles(arrow) and lateral avicularium(lav).

PLATE 4

Figs. 1-3. *Stephanosella biaperta* (Michelin, 1845)

Fig. 1. Colony.

Fig. 2. Arrangement of zooecia with frontal avicularium(fav). Round avicularium(arrow) is situated on lateral side of orifice(or).

Fig. 3. Orifice with condyles(arrow) and pointed lateral avicularium(*).

PLATE 5

Figs. 1-3. *Adeonella platalea* Busk, 1884

Fig. 1. Arrangement of zooecia with circular or semicircular orifice(or).

Frontal avicularium(fav) is triangular and vicarious one(vav) is round.

Fig. 2. Colony.

Fig. 3. Avicularium(arrow) in the margin of colony.

PLATE 6

Figs. 1-2. *Adeonella polymorpha* Busk, 1884

Fig. 1. Colony.

Fig. 2. Arrangement of zooecia with circular or semicircular orifice(or).

Frontal avicularium (fav) is triangular and vicarious one(vav) is subtriangular.

Fig. 3. *Iodictyum deliciosum* Harmer, 1934

Arrangement of zooecia in the colony with fenestra(f).

Orifice(or) with marginal denticulation and frontal avicularium(fav).

PLATE 7

Figs. 1-5. *Phidolopora pacifica* (Robertson, 1908)

Fig. 1. Colony.

Fig. 2. Arrangement of zooecia in the colony with fenestra(f).

Fig. 3. Zooecium with two spines and operculum(op).

Fig. 4. Frontal avicularium with hooked rostrum.

Fig. 5. Dorsal view showing kenozoecium with avicularium(av) similar to frontal avicularium below the fenestra(f).

PLATE 1

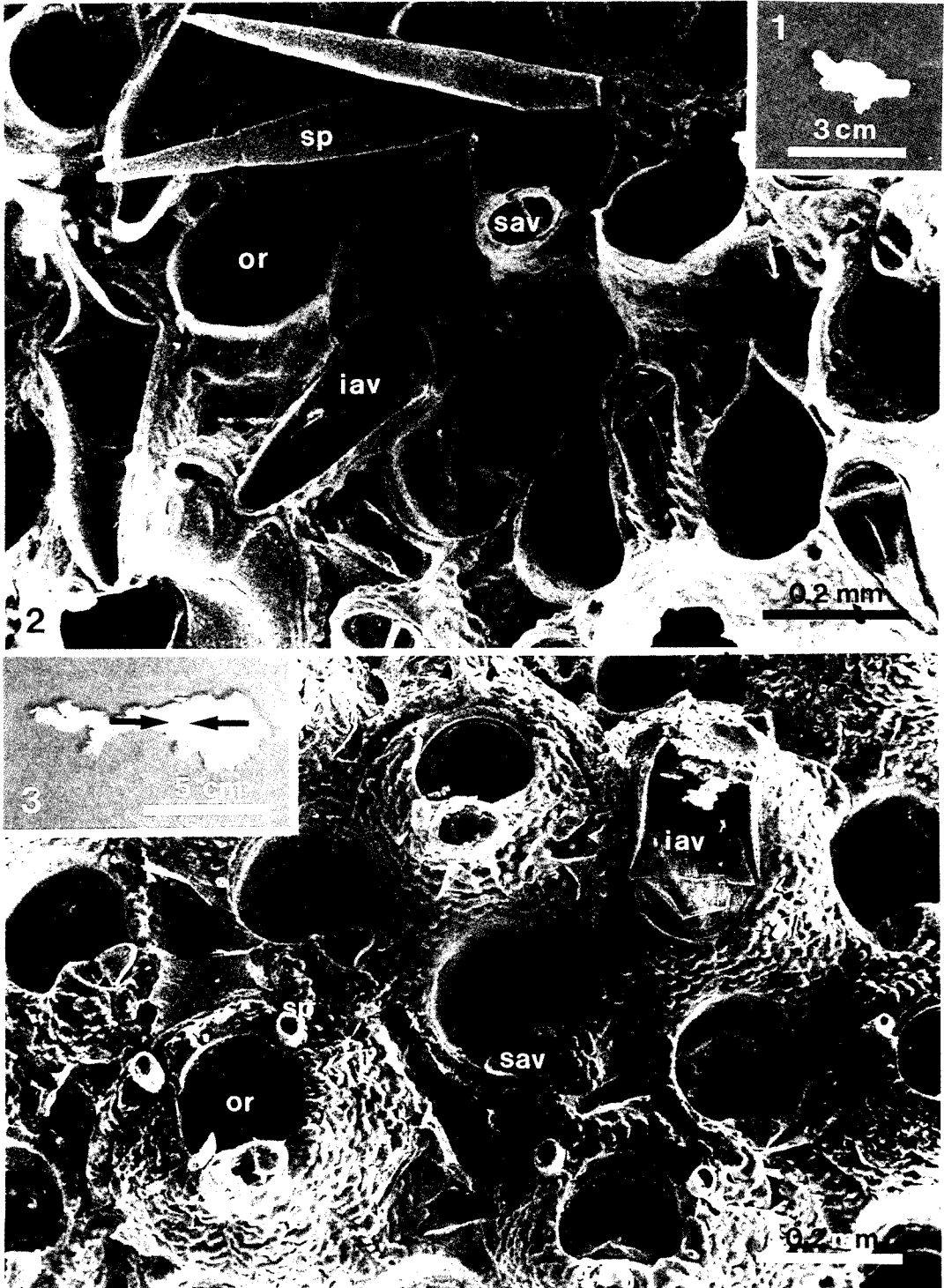


PLATE 2

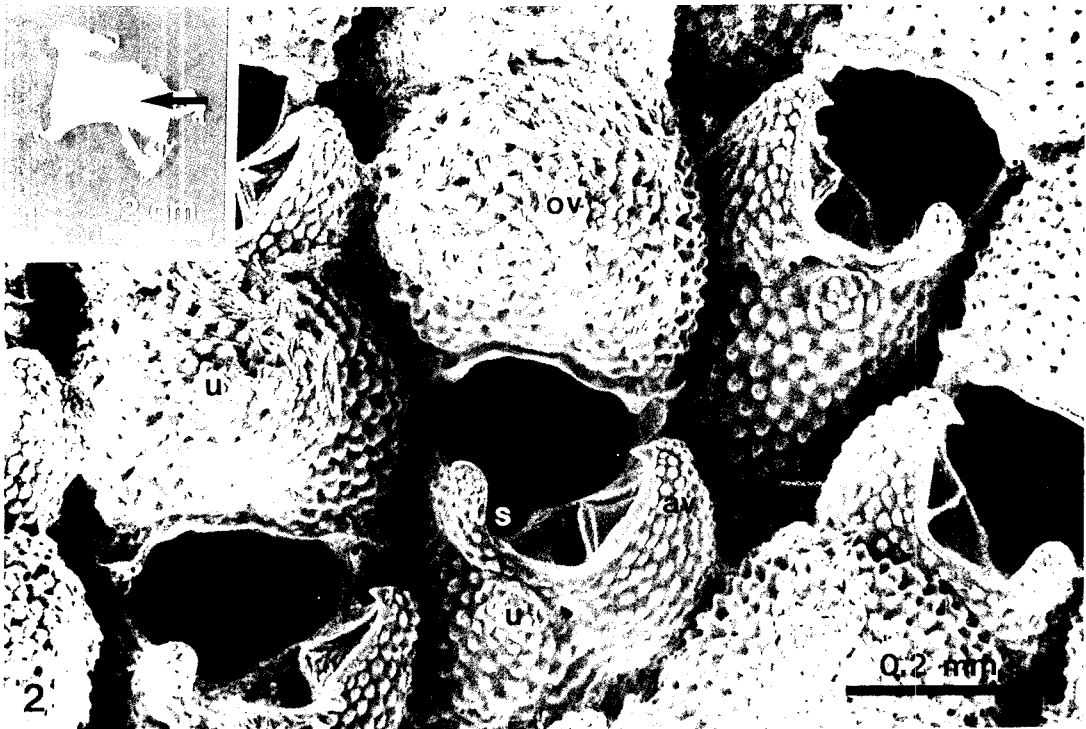


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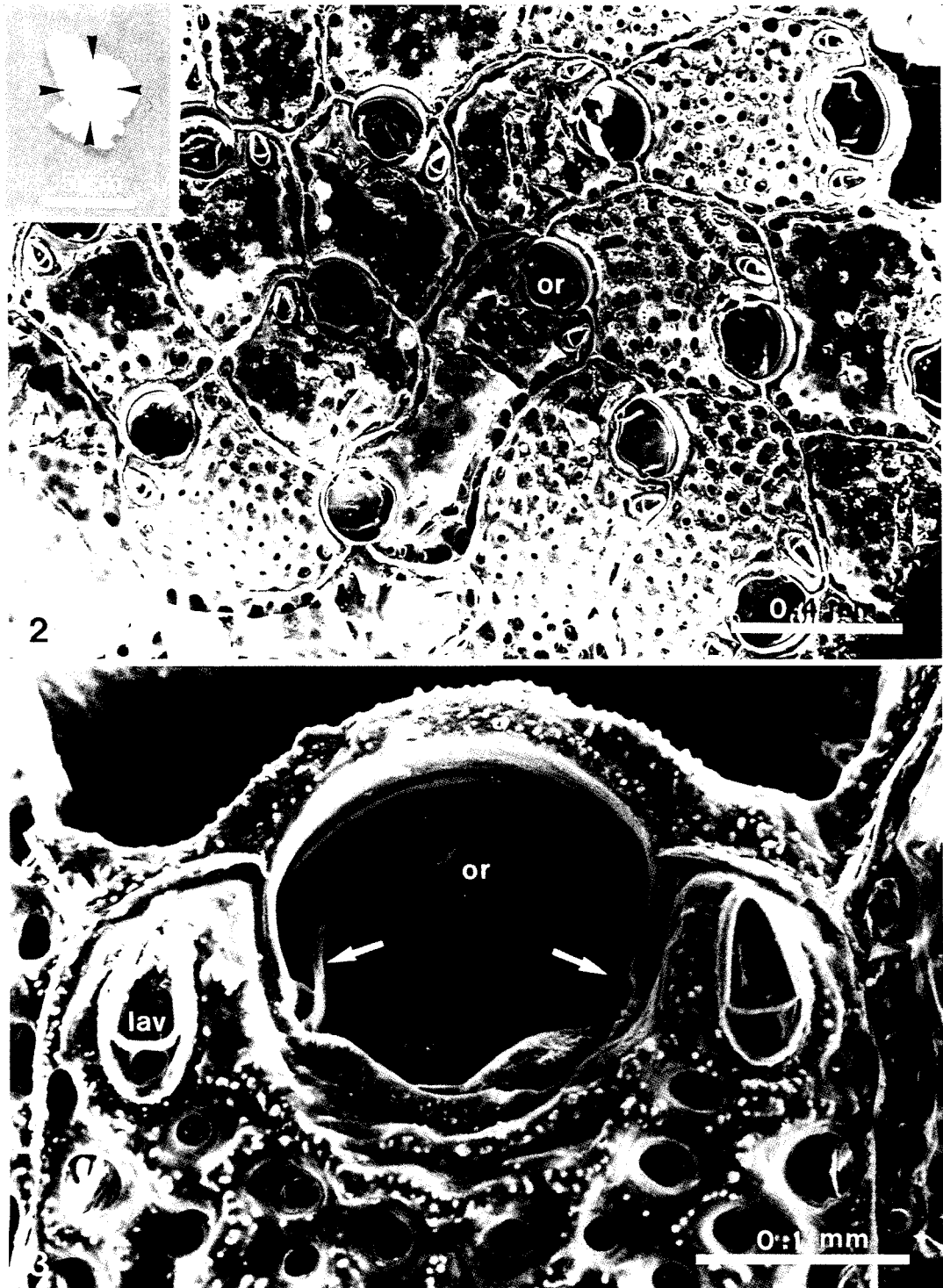


PLATE 4



PLATE 5

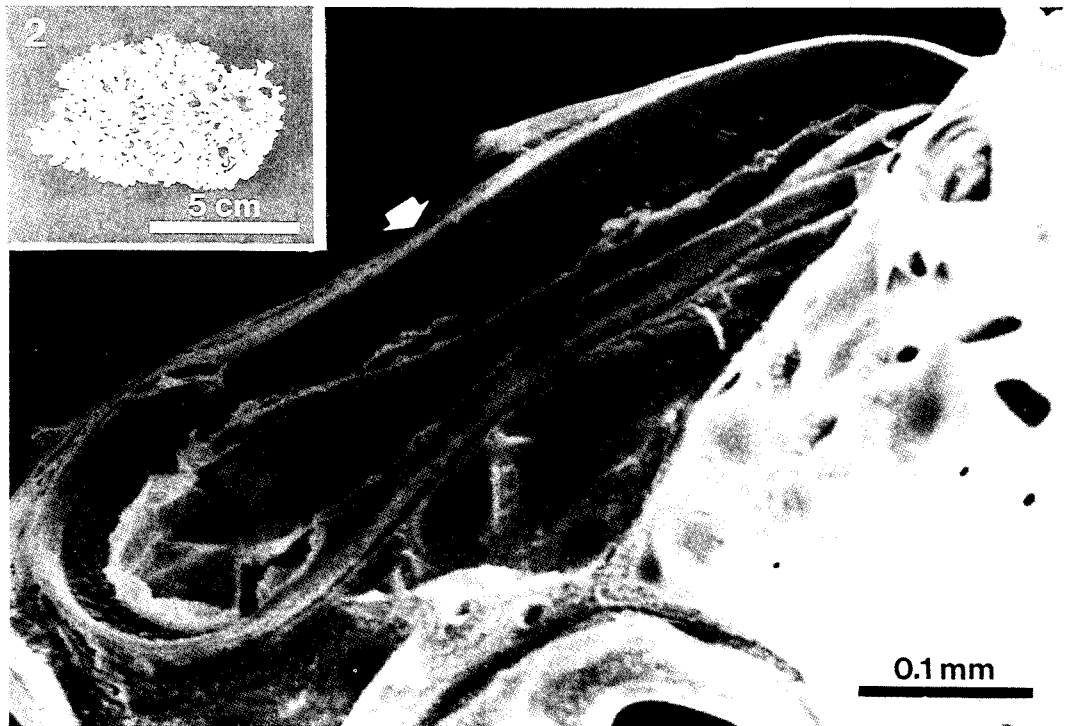
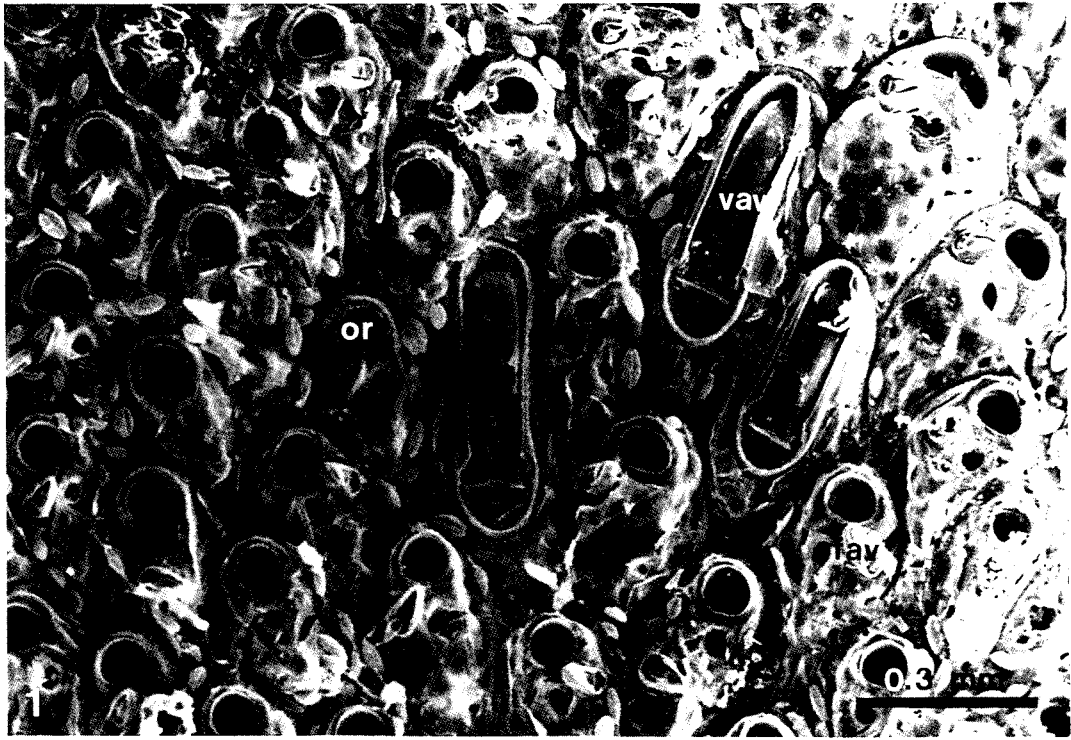


PLATE 6

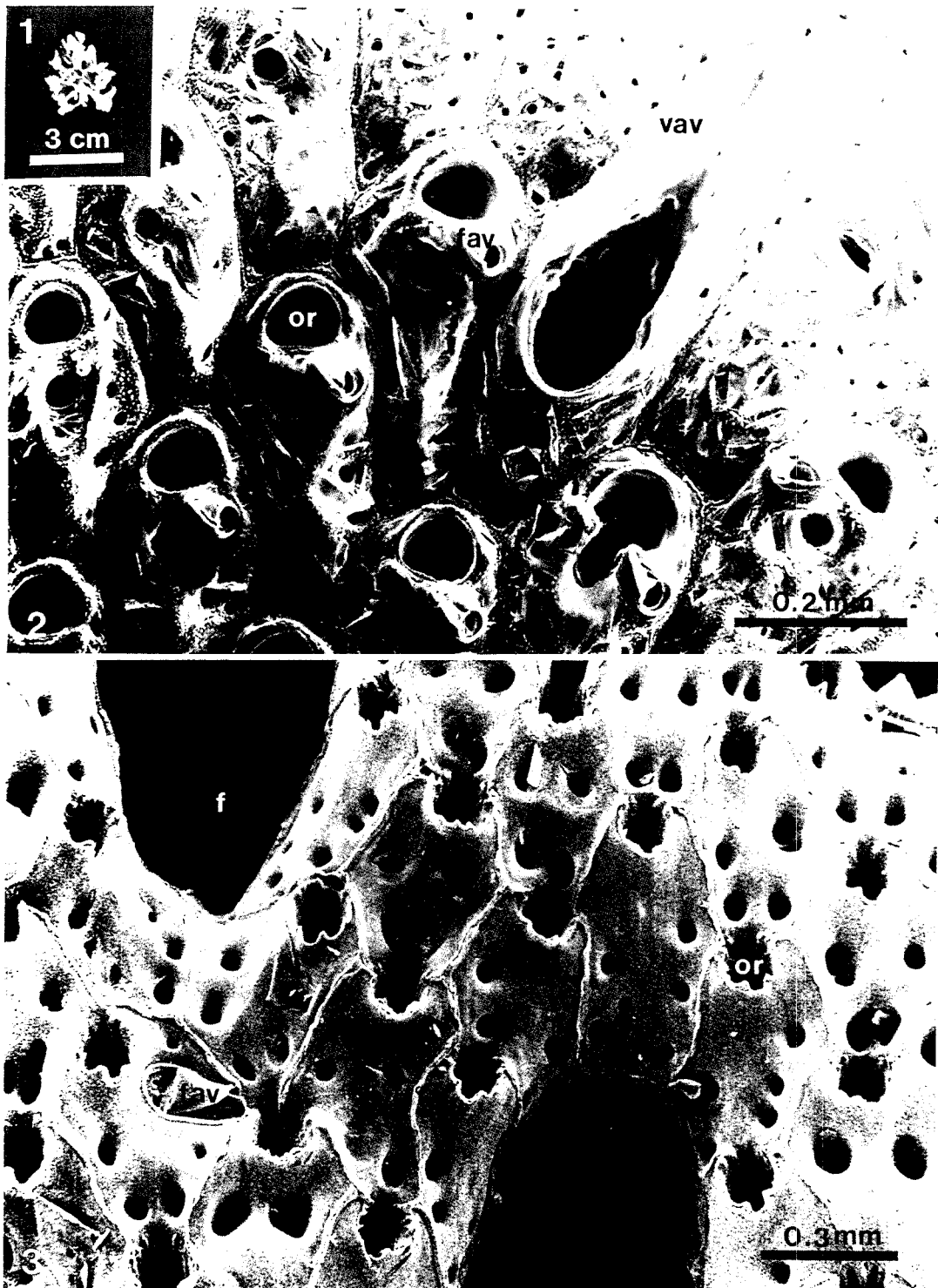


PLATE 7

